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Gray Davis, Governor

CALIFORNIA ENERGY COMMISSION

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TABLE OF CONTENTS

Executive Summary	iii
Recent Trends—Volatile Prices and Constrained Infrastructure	iv
Energy Agencies Identify Strategies for California’s Future	iv
Recommended Actions for the Governor and Legislature	v
Continue to Harvest Energy Efficiency Opportunities.....	v
Diversify Fuel Types and Sources as a Hedge for California’s Energy Future	vi
Leverage Opportunities for Customers to Determine their Energy Future	vi
Create a More Resilient Energy System by Improving Infrastructure.....	vi
Section I: Introduction	1
Section 2: Energy Trends and Outlooks	3
Transportation Energy	3
Recent Trends in Meeting California’s Transportation Energy Needs	3
California’s Demand for Petroleum Products Continues to Grow	4
Electricity	5
Recent Trends in Meeting California’s Electricity Needs	5
Future Electricity Outlook	6
Transmission Trends and Outlook	7
Natural Gas Trends and Outlook	8
Recent Trends in Natural Gas Price Volatility.....	8
Natural Gas Demand Continues to Grow	9
Growing Concerns about Adequate Natural Gas Supplies.....	10
Section III: Energy Policy Issues & Recommendations	12
Introduction	12
Continue to Harvest Energy Efficiency Opportunities	12
Improve Vehicle Efficiency	12
Recommendations	13
Improve Natural Gas and Electricity Efficiency	13
Maximize Cost-Effective Energy Efficiency	13
Recommendations	14
Evaluate Dynamic Pricing and Demand Response Programs	15
Recommendation	16
Diversify Fuel Types and Sources as a Hedge for California’s Future	16
Reduce Petroleum Dependence	16
Options to Reduce Petroleum Dependence	16
Recommendation	17
Reduce Natural Gas Dependence	17
Options to Reduce Natural Gas Dependence	18
Recommendation	19
Leverage Opportunities for Customer Choice	19
Promote Retail Customer Choice	19
Recommendation	20
Encourage Distributed Generation.....	20
Strengthen California’s Energy Infrastructure	21

Transportation Energy Infrastructure Issues	21
Recommendation	22
Electricity Infrastructure Issues	22
Recommendations	23
Transmission Infrastructure Issues	23
Recommendation	25
Natural Gas Infrastructure Issues	25
Recommendation	25
Section IV: Stewardship of California's Environment	26
Protect Fresh Water	26
Water Supply	26
Water Quality	26
Global Climate Change	27
Recommendations	27
Cross-Border Issues	28
Recommendation	28
Hydroelectricity Facility Re-licensing	28
Section V: Conclusion	29

Executive Summary

High and volatile energy prices, energy supply disruptions, and fragile energy infrastructure—a glance in the rearview mirror at California's recent *past*? Definitely.

Although stable, California's *present* energy situation is tenuous. Despite recent improvements to the system, unless the state acts now, California's *future* will be growing demand, supply disruptions, and high and volatile energy prices.

California's failed experiment with electricity restructuring is well-known, when prices skyrocketed and California customers were systematically removed from the grid on several occasions to avoid widespread blackouts. Fortunately, unlike residents on the East Coast in early September 2003, Californians were not stuck in the subway; in 2000 to 2001, California managed the supply disruptions and prevented its grid from collapsing.

Far from accepting the personal, social, and economic pain of the electricity crisis of 2000 to 2001, California redoubled its efforts to improve the energy system. Although little has been done to modernize the bulk transmission system, the state has added over 9,500 megawatts of electricity.

Nor did California consumers passively write checks for high electricity bills in 2000 and 2001. Instead, they "flexed their power," they replaced inefficient appliances, turned down their thermostats, and postponed using energy-intensive appliances during peak hours. Through these efforts, California consumers reduced their peak demand by over 5,000 megawatts in 2001—in effect removing the equivalent of 375,000 homes from the electricity system. More importantly perhaps, some of these reductions are permanent energy efficiency gains that will continue to reduce demand in the future.

Over the last two decades, natural gas has become the fuel of choice for electric generation, growing from 25 to 36 percent of generation currently. Since natural gas prices have been increasingly volatile, California's greater dependence on natural gas for electric generation renders consumers more vulnerable to high prices.

At the height of the energy crisis, natural gas prices shot up to nearly \$60 per million British thermal units, or million Btu. To address this problem, the state increased natural gas pipeline capacity by 25 percent and its total capacity to store natural gas by almost 10 percent. These infrastructure upgrades relieved congestion by moving natural gas supplies to areas of demand, helping to ensure adequate supplies in the near-term.

Regarding petroleum, California refiners are completing nearly \$800 million in upgrades to meet federal oxygenate requirements. Without interrupting gasoline delivery, these upgrades are being made.

Recent Trends—Volatile Prices and Constrained Infrastructure

Yet despite these enhancements, Californians remain vulnerable to supply disruptions and high prices. In-state refineries operate near maximum capacity. Any outage or pipeline failure, as recently happened in Arizona, quickly translates into high prices for gasoline and diesel fuel. These events in August 2003 caused California consumers to pay an average of \$2.10 for a gallon of gasoline.

Tight supplies and volatile prices remain a concern as demand for gasoline outpaces in-state production, while adding ethanol to California gasoline will further reduce in-state production. As a result, California is relying more on imports of petroleum products. To ensure that imports are as quickly available as possible, the state needs to upgrade its marine facilities, which are also nearing capacity.

California's unique location at the end of the West Coast natural gas pipeline network makes it particularly vulnerable to supply disruptions and price volatility. Adding a liquefied natural gas (LNG) terminal on the West Coast will help reduce the state's vulnerability by adding another source of natural gas.

After a decade of relatively low prices, natural gas prices at the California border are now averaging about \$5 per million Btu. Moreover, as recently as February 2003, natural gas prices spiked, rising from \$5.68 to \$9.54 per million Btu at the Southern California border, a 63 percent rise in two days.

Natural gas prices have been higher and more volatile in recent years because of demand growth and at least a perception that natural gas production will not keep pace with demand.

While the electricity markets have been relatively stabilized for now, and rates are declining, Californians still pay the fifth highest rates in the nation. And even with California's successful conservation and efficiency programs, demand is rising each year.

California, thus, remains at risk for demand and supply variations associated with weather, evolving market rules, increasing dependence on natural gas, and local reliability problems in San Francisco and San Diego. These vulnerabilities may continue to rise throughout this decade and into the next.

If we are to meet our future energy needs, California must act now to mitigate its vulnerability to supply disruptions and price volatility effectively.

Energy Agencies Identify Strategies for California's Future

In response to the energy crisis, the state's energy agencies developed strategies in the *Energy Action Plan* (the *Plan*). In April 2003, the Energy Commission, the California Public Utilities Commission (CPUC), and the California Consumer Power and Financing

Authority (CPA) adopted the *Plan*, identifying several public interest energy strategies for California's future.

Although the *Plan* does not address transportation, the Energy Commission and California Air Resources Board developed a transportation energy strategy and a set of goals in their report, *Reducing California's Dependence on Petroleum*.

These two documents are the starting point for this first *Integrated Energy Policy Report (Energy Report)*. Through this *Energy Report*, the state has the opportunity to craft a cohesive set of policies to guide our energy future. The policies we develop now will shape the investments necessary to assure that our future energy needs are reliably and cost-effectively met, while providing for economic growth, preserving the public health and safety, and improving environmental quality.¹

The state needs a clear and focused integrated planning process to procure, implement, and monitor electricity resources. Unless the state repairs its fragmented and ineffective transmission planning and permitting processes, California will not reap the benefits of the policies proposed in this report. The key here is to establish a direct link between this report and the CPUC's existing resource procurement proceedings.

The state also must work to moderate its growing demand for transportation fuels. Unless the infrastructure to import and distribute fuels is expanded, supply constraints and price volatility will remain a part of the market.

State energy policies need to recognize the mix of regulated and competitive markets that currently serves our energy needs. The Energy Commission believes that state energy policies should capture the best features of both vigorous, competitive energy markets and prudent and effective regulation.

Recommended Actions for the Governor and Legislature

As mandated by the Legislature, the *Energy Report* must include all energy forms, energy providers, and energy consumers throughout the state. (Section III for more detailed policy recommendations.)

Following the framework set forth in the *Plan*, the Energy Commission highlights the following energy policy recommendations:

Continue to Harvest Energy Efficiency Opportunities

- Enhance energy efficiency programs to harvest 1,200 MW of electricity and 103 million Btus of natural gas in energy efficiency savings as a first priority for securing California's energy future.

Diversify Fuel Types and Sources as a Hedge for California's Energy Future

- Enact legislation to accelerate the renewable portfolio standard to 20 percent in 2010.

Leverage Opportunities for Customers to Determine their Energy Future

- Explore, through an expedited collaborative, a retail market structure that promotes customer choice.

Create a More Resilient Energy System by Improving Infrastructure

- Ensure that efficiency programs and renewable energy are factored into the investor-owned utilities and municipal utilities procurement programs *before* they sign long-term contracts.
- Consolidate the permitting process for all new bulk transmission lines at the Energy Commission, modeling the process on the Energy Commission power plant siting process.
- Ensure that existing and new natural gas storage capacity have priority for meeting peak demand in the electricity and natural gas systems.
- Coordinate permit reviews with all entities to develop an LNG terminal on the West Coast.
- Create clear requirements for all electricity providers to ensure and maintain the appropriate operating reserves to keep California's lights on.
- Expand the state's existing program to monitor and evaluate activities of the state's energy systems to prevent another crisis.

Drawing from *Reducing California's Dependence on Petroleum*, the Energy Commission recommends the following steps in the transportation energy sectors:

- Reduce on-road petroleum demand by 15 percent below petroleum demand in 2003.
- Build a coalition with other states to pressure the federal government to double the corporate average fuel efficiency standards (known as CAFÉ).
- Increase non-petroleum fuel use to 20 percent of California's consumption by 2020 and further increase it to 30 percent by 2030.

- Establish a one-stop state licensing authority for petroleum infrastructure, which can expedite permits for new facilities to increase the supply of petroleum products to California.

Section I: Introduction

California consumes large amounts of energy—17.5 billion gallons of gasoline and diesel, 253.5 million megawatt hours of electricity, and 7 billion cubic feet of natural gas each year.

Despite being the world's fifth largest economy, our state is facing a serious challenge to provide the most reliable, cost-effective, efficient, and environmentally-sound energy for its growing population. An inadequate and aging system of electricity transmission lines, power plants, refineries, pipelines, and port and storage facilities all require modernization to meet our growing energy demand.

The Energy Commission, under Senate Bill 1389, has responsibility for developing energy policies for California that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety.

In April 2003, the state's three primary energy agencies—the Energy Commission, CPUC, and CPA adopted the *Energy Action Plan*, (the *Plan*) which outlines the following public interest strategies for the electricity and natural gas systems:

- Meet California's energy growth while optimizing energy conservation and resource efficiency and reducing per capita electricity demand.
- Accelerate the state's goal for renewable resource generation.
- Promote customer and utility-owned distributed generation.
- Ensure a reliable supply of reasonably-priced natural gas.
- Upgrade and expand the electricity transmission and distribution infrastructure and reduce the time to get needed facilities on-line.

In addition, Senate Bill 1389 requires the Energy Commission to assess major transportation energy trends and issues facing the state.

Following this brief introduction, the *Energy Report* includes five sections:

Section II highlights recent trends and expected developments within the transportation, electricity, and natural gas industries.

Section III presents the major energy policy issues affecting the state along with a series of recommendations for consideration by the Governor and the Legislature.

Section IV investigates energy policy issues and their relationship to the environment.

Section V offers concluding observations.

When choosing among these strategies, the Energy Commission must assess the tradeoffs and balance the broad public policy goals articulated in Senate Bill 1389.

Balanced energy policies will provide the stable environment necessary to attract investments in energy efficiency and infrastructure. It is imperative that we take actions today to meet the demand for more energy resources and services while still protecting our economy and environment. For the policies in this document to be successful, California energy agencies will need to establish a direct link between the *Energy Report* and the CPUC's procurement process.

Section 2: Energy Trends and Outlooks

By 2010, California will add over five million people, a 15 percent increase, and economic activity is expected to double, a 30 percent increase in the state's economy. As a result, we anticipate that the demand for energy—transportation, electricity, and natural gas—will grow correspondingly. Controlling that growth in energy use is critical to the state's future.

Transportation Energy

The demand for transportation fuels in California is increasing at an alarming rate, surpassing in-state refining capacity as California's refiners rely increasingly on imported petroleum products to meet demand. These imports come in through ocean ports, which are reaching maximum capacity. Although long-term strategies can reduce California's petroleum consumption, near-term supply constraints and price volatility remain a serious concern.

Recent Trends in Meeting California's Transportation Energy Needs

Californians consume nearly 48 million gallons a day of petroleum fuels, accounting for nearly half of California energy consumption in a year. Demand for gasoline and diesel has increased 53 percent from just twenty years ago. Several factors explain the increase, including:

- Population growth and an associated increase in the number of on-road vehicles.
- A substantial increase in the number of miles traveled, the result of both the declining per-mile cost of gasoline and land-development patterns that place jobs and communities increasingly farther apart.
- The shift in consumer preference to larger, less efficient automobiles, such as Sport Utility Vehicles (SUVs).
- A lack of viable and cost-effective alternatives to petroleum fuels.

National vehicle efficiency standards offset these trends when the standards went into effect in 1985, significantly reducing on-road fuel use.

Until recently, California refiners produced enough transportation fuels to meet in-state needs and to export to neighboring states. However, while demand has grown considerably, the industry has not built a new refinery in California since 1969.² At the same time, several refineries have shut down since 1989, further reducing statewide refining capacity by nearly 20 percent.

Since the mid-1990s, refiners have increased production slightly, through process improvements at existing facilities, but not enough to keep pace with the steady, growing demand for gasoline and diesel fuel. As a consequence, California increasingly relies on imports of blending components and finished products from other states and countries to meet demand. Today, refiners import over three million gallons of gasoline and blending components each day, a tenuous situation given the limited number of out-of-state refineries currently producing California gasoline.

With California refineries operating near maximum capacity for much of the year, any upset in the petroleum system immediately translates into tight supplies and higher prices at the pump. Further, since gasoline and diesel demand does not drop when prices spike, even small shortfalls in supply can cause very significant price swings. Spurred by record prices for crude oil and refinery problems in California, the average price for gasoline spiked to a record level of \$2.15 a gallon.

As California learned in August 2003, infrastructure problems in other states can seriously affect California. When an Arizona pipeline bringing gasoline supply from Texas recently ruptured, California refiners diverted supply to Arizona because California was the only nearby source of gasoline. When combined with several refinery outages on the West Coast, the events caused the price of gasoline in California to spike to \$2.10 a gallon.

Early in 2002, supply disruptions became a major concern, as California refiners began replacing methyl tertiary butyl ether, or MTBE, with ethanol in California gasoline. Although Governor Davis had originally ordered refiners to eliminate MTBE by the end of 2002, the deadline was extended until the end of 2003, when concerns about adequacy of ethanol and gasoline supplies were raised. However, refiners accounting for 70 percent of the state's gasoline supply went ahead with plans to eliminate MTBE well in advance of the new deadline. To date, California has avoided any ethanol-related disruptions from this early phase out.

Although petroleum is the primary source of California's transportation fuels for the foreseeable future, California is home to a growing number of alternative-fuel vehicles. Currently more than 20,000 cars, transit buses and trucks are operating on natural gas and liquefied petroleum gas, along with the nearly 13,000 electric vehicles. When totaled, these vehicles save California the equivalent of 50 million gallons of gasoline each year.

California's Demand for Petroleum Products Continues to Grow

Despite California's efforts to develop an alternative fuels market, the state's demand for petroleum is expected to grow significantly over the next 20 years, driven largely by population growth. We expect gasoline and diesel demand for on-road vehicles to increase 36 percent and the demand for jet fuel to more than double.

As demand continues to increase, imports of foreign crude oil will grow as in-state and Alaskan supplies diminish. Additionally, the transition to ethanol as the only oxygenate for California gasoline will reduce refinery production by as much as 5 percent. With refineries operating close to full capacity, daily imports of gasoline and diesel will more than double to 8 million gallons by 2010.

California is not connected by pipeline to refining centers in other states. As a result, gasoline, diesel, and blending components must be imported by marine tanker. Like refineries, the state's marine facilities—where imports are off-loaded, stored and distributed—operate at or near capacity. Since inventories represent only ten days of supply on average and replacement supplies can take up to eight weeks to reach marine terminals, gasoline and diesel markets become increasingly volatile, with the likelihood of supply shortages and more prolonged periods of high prices.

Electricity

California's electricity system is a complex grid of electric power plants and transmission lines which meet the state's need for electricity, instantaneously balancing supply and demand. The California grid interconnects to the surrounding Western States, Mexico, and Canada, allowing utilities to exchange energy and share reserve support to the benefit of every region. However, as the recent Eastern blackout demonstrated, interconnected systems can expose homes and businesses to vulnerabilities, as well.

Recent Trends in Meeting California's Electricity Needs

As California's economy expanded in the 1990s, so did its electricity consumption. However, improvements in energy efficiency offset much of the state's growth in electricity consumption. Thus, California's per capita electricity use has grown very slowly since the state initiated its energy efficiency standards and programs in the mid-1970s.

During the 1990s, power plant development in California and the West did not keep pace with demand growth, largely because of uncertainties regarding the pending electricity market restructuring at the federal and state levels. California's effort to restructure the electricity industry had its roots in the interest of some customers to be able to choose their own electricity suppliers,³ and beginning in 1998, most Californians could choose an energy supplier other than their local utility. At its peak, direct access providers represented 2 percent of all customers and 7.5 percent of all large customers. In terms of electricity, they represented 16 percent of all sales and 25 percent of all large customers' sales. As a result, local utilities no longer planned on serving significant portions of California's electricity users.

As the energy crisis began in the summer of 2000, wholesale electricity prices dramatically increased, and as the winter of 2000 and 2001 approached, the price of natural gas more than doubled, further exacerbating the electricity price increases. Prices continued to climb during the winter of 2000-01, the off-peak period for electricity

consumption in California. Utilities throughout the West incurred enormous costs to purchase electricity during the crisis. Many direct access providers could no longer offer savings to customers. As direct access providers dropped out of the market, local utilities suddenly found themselves responsible for California's electricity users that they had not anticipated.⁴

During this same period, the reliability of the California grid was in serious jeopardy numerous times throughout the summer of 2000 and, more surprisingly, during the winter of 2000-01 when demand was low. In the winter of 2001, utilities instituted systematic rotating outages to maintain grid stability and prevent more severe and widespread blackouts. Since 2001, California's electricity situation has stabilized, with sufficient reserves to maintain reliability, and currently wholesale prices are substantially lower than at the height of the energy crisis. Unfortunately, stability came at a price.

To ensure system reliability, the state was forced to negotiate long-term contractual arrangements,⁵ and although these contracts restored stability and lowered costs, compared to the prices at the height of the energy crisis, the negotiated prices are much higher than current spot market prices. Furthermore, the contractual terms have at times imposed inflexible system dispatch. As a consequence, while the physical infrastructure currently provides reliable electricity, the prices that consumers pay for electricity are higher than in the 1990s. These higher prices will continue for at least the length of the contracts, some of which exceed ten years.

Future Electricity Outlook

As noted above, population and economic activity drive electricity consumption growth in California, while these factors and weather conditions drive peak electricity demand growth.⁶

The Energy Commission believes that California should have adequate supplies of electricity through 2006 under average temperature conditions. However, concerns about supply adequacy surface beginning in 2007. Under a "hot temperature" 1-in-10 weather scenario, reserve margins could fall below five percent in 2007 and even lower thereafter, which could put the state at risk.

The Energy Commission has local reliability concerns about San Diego and the San Francisco peninsula. Both areas experienced serious reliability problems during the energy crisis. Not surprisingly, both areas have limited generation within their own electrical boundaries and limited transmission capacity to access generation outside of those boundaries. New generation development and demand reduction programs in San Diego could contribute to a near-term reliability solution, and at least two major facilities are being evaluated that could improve the reliability picture in the Bay Area.

The future of California's electricity picture lies in the resource planning process, which places great emphasis on a stable and sustainable electricity system. The state's three large investor-owned electric utilities—Pacific Gas and Electric (PG&E), Southern

California Edison (SCE), and San Diego Gas and Electric (SDG&E)—who serve over 80 percent of the state’s demand, are actively developing both interim and long-term resource procurement plans under the supervision of the CPUC. As these plans are developed, the following issues should be carefully considered:

- Natural gas-fired generators satisfy one-third of the state’s electricity needs, and that number is expected to reach 45 percent in the next ten years. The exposure to price volatility, the level of average energy bills, and the environmental impacts of electricity supplies depend not only on the total amount of electricity consumed throughout the year but also the fuel source of electricity generation.
- Economic activity varies cyclically, and these variations on electricity demand are likely to continue to be significant. Resource plans should consider this point in meeting demand growth associated with variations in economic activity.
- Many older power plants, while less efficient and more polluting than the new generation of gas-fired facilities, continue to operate because of long-term contracts or to ensure local and system reliability for the grid. These requirements prevent California from reaping the full benefits that new, more efficient generators could provide.
- California is adding new renewable facilities. Accelerating the pace of renewable development identified in the RPS will likely produce substantial benefits, even in this situation. However, the Energy Commission’s analysis suggests that regardless of their inferior qualities, some older, gas-fired facilities may continue to operate based on their locations, which enable these facilities to support local grid reliability, or based on their contractual dispatch priority. When these constraints are in play, renewable resources displace the output of new, more efficient gas-fired facilities.

Finally, the Energy Commission believes there should be a connection between resource planning and research. Most technology development for large-scale power plants is being funded privately, or in the case of coal and nuclear, by the U. S. Department of Energy. However, the Energy Commission’s Public Interest Energy Research (PIER) program is investing in research to develop low-cost dry cooling technologies, and the Federal Energy Regulatory Commission is assessing the cumulative impacts of hydroelectric facilities and studying the electricity market in its ongoing re-licensing proceedings.

Transmission Trends and Outlook

The investor-owned utilities—PG&E, SCE, and SDG&E—originally designed, built, and operated their own transmission systems to meet their own customers’ needs. As a consequence, most of California’s electric transmission system was built to connect nearby generating facilities to major load centers in the Los Angeles, San Francisco, San Diego, and Sacramento areas, requiring relatively short transmission lines. As

such, until the mid-1960s, the IOUs operated their transmission systems as islands, with only a few small ties between them. The IOUs then began planning and building long, high-voltage lines to neighboring states, primarily to import less costly power from the Pacific Northwest and Southwest.

Over the last 20 years, several utilities have proposed bulk transmission system enhancements; however, most projects were not approved. Subsequent additions to the transmission grid have been limited to the upgrading of intrastate transmission lines to serve new load, reduce local congestion pockets, and improve overall efficiency. As a result, congestion on the transmission system is a frequent occurrence, and economic opportunities to import power from out-of-state have been limited in recent years.

The Energy Commission's transmission-related research and development investments through its PIER program have and are continuing to focus on developing new tools and materials to reduce outages, improve the efficiency, and expand the capability of the state's transmission grid to transfer power effectively throughout the state.

Natural Gas Trends and Outlook

California is the nation's second largest consumer of natural gas.⁷ With demand for natural gas further increasing to meet the needs of the growing power generation market and price volatility a more frequently occurring event, state policy makers have questioned California's increasing dependence on natural gas.

Recent Trends in Natural Gas Price Volatility

In the past three years, California consumers have experienced two significant natural gas price spikes. In the winter of 2000-01, gas prices were high throughout the country; however, the magnitude of the price spikes in California was largely a function of the electricity crisis.⁸ Prices exceeded \$8 per million Btu at the California border and peaked at nearly \$60 per million Btu. California consumers' natural gas bills soared relative to consumers in other parts of the nation.

Several factors exacerbated the price spike. First, hydroelectric production throughout the West reached records lows. Gas-fired generators filled the gap left by these diminished hydroelectric supplies, which helped to draw down storage inventories in the summer. In addition, the state's pipeline capacity was not sufficient to bring natural gas into the state to replenish storage. At the same time, electric generators and other noncore customers were not interested in placing gas in storage when prices were so high. Thus, the state entered the winter with record low storage inventories.

Last winter's price spike once again increased natural gas bills to consumers. Unlike the previous period, however, California natural gas users fared well compared to consumers in the rest of the country. National spot prices for natural gas tripled in late February, driven by a prolonged cold snap in the Northeast, concerns about the impacts of war in Iraq, and low nationwide storage levels. Prices in California were also affected,

rising above \$9 per million Btu at the height of the price spike. However, California's relatively high storage inventories and unseasonably warm weather allowed prices to return to pre-spike levels relatively quickly and allowed them to stay below national levels.

California's vulnerability to price spikes and higher natural gas prices in general is largely due to its growing dependence on a single fuel for power generation. The overall level of natural gas prices nationwide over the last several years calls into question the point of view, developed during the 1980s and 1990s, that natural gas will be plentiful and cheap into the foreseeable future. Our current assessment is that natural gas supplies will continue to be available but at much higher prices than previously predicted.

Natural Gas Demand Continues to Grow

Natural gas demand in California is projected to increase due to the growing use of natural gas for electric generation. That trend is even greater in the rest of the western U.S.

The efficiency of California homes and gas appliance has increased since the 1970s because of California's building and appliance standards. As a result, natural gas demand for uses other than electric generation is expected to grow at only one-half percent per year over the next ten years, compared to a 1.5 percent annual growth rate in natural gas consumption in the electricity generation sector.

Since the energy crisis of 2000-01, the state has taken a number of steps to enhance its natural gas infrastructure. California has increased its access to out-of-state production through expansions of key interstate pipelines delivering gas from the Southwest, Canada, and the Rocky Mountains. Under CPUC oversight, Southern California Gas Company (SoCalGas), and PG&E have expanded their capacity to receive out-of-state supplies and have enhanced the operational flexibility of their pipeline systems. The CPUC has also authorized the utilities to increase natural gas storage capacity, including increased withdrawal and injection capabilities for existing utility storage and the addition of new non-utility storage facilities. As important as these improvements are to enhanced capability of the state's natural gas system, additional improvements will be necessary during the next decade.

The Energy Commission believes that, under average annual conditions, pipeline capacity is adequate to meet the needs through 2013 in Southern California and through 2006 in Northern California. Meeting peak day conditions driven by weather extremes may require infrastructure investments earlier than these timeframes.

States to the east and north of California face growing electricity demand which they plan to meet with new gas-fired generators. Generators in Arizona and New Mexico will most likely take supplies from Southwest natural gas production basins, while generators in Oregon and Washington will likely take supplies from Canada. With

California located at the end of the pipelines that would transport gas to our neighboring states from these production basins, pipeline capacity from these producing basins may no longer be adequate to serve our state's demand.

With demand for natural gas further increasing to meet the needs of a growing electricity generation market, concerns have emerged among state policy makers about California's increasing dependence on natural gas. These concerns have become even more pronounced with price volatility becoming a more frequent event. The risks associated with long-run increases in the price of natural gas and supply shortfalls can be mitigated by reducing demand for natural gas as a generation fuel.

Growing Concerns about Adequate Natural Gas Supplies

About 85 percent of California gas supplies come from sources outside the state. There is general agreement that there is an abundance of natural gas in the ground throughout the United States, Canada, and Mexico. However, what is less clear is whether the industry can find and extract sufficient conventional and unconventional gas supplies at competitive prices to meet growing natural gas demand.

Historically, technology advancements have increased the ability of producers to find new sources of natural gas. However, total production in the U.S. alone would have to increase from 18.7 trillion cubic feet (TCF) in 2003 to 21.8 TCF by 2013 to meet demand. Even factoring in technology advancements, that level of increase will be difficult to attain without significant financial investment in resource development and increases in drilling rig activity.

There is considerable interest in developing LNG facilities in North America as an alternative to increasing production capacity. In the past two years, a number of developers have shown interest in building LNG facilities on the West Coast, along the coast of both Mexico and California. There have been at least 10 projects proposed along the West Coast during the past year. However, financial backing is probably available to support construction of only one or two projects.

Given recent regulatory activity in Mexico, which includes approval of all necessary permits for one proposal, it appears likely that at least one project will be built along the Baja California coast. While the pipelines from Baja California are sufficient to transport natural gas to Southern California, getting access to pipelines within Southern California is a concern.

Prospects for major expansion of California-produced gas relative to the needs of its populace are limited. While we need to encourage enhanced production of in-state natural gas consistent with environmental protection requirements, the state must rely on outside sources to meet its growing demand. The completion of an LNG facility on the West Coast could add in excess of 1 billion cubic feet (BCF) per day of incremental supplies. More importantly, it provides a potential opportunity for California to access

supplies from other countries and continents that may help to bring competitive pressures on Canadian and U.S. gas suppliers.

The Energy Commission's natural gas research and development strategy has been limited by the lack of a public interest research program for natural gas. Consequently, our strategic focus has been limited to improving efficiency and reducing emissions from smaller, natural gas-fired generators. When the CPUC's public interest natural gas research program, which it is currently considering, is implemented, it should include areas such as environmental impacts mitigation, safety improvements, the development of more efficient gas end-use technologies, and technologies to ensure reasonably priced gas resources. The natural gas research program should be designed to complement the Energy Commission's electricity research program to allow the development of joint strategies that benefit both electricity and natural gas ratepayers.

Section III: Energy Policy Issues & Recommendations

Introduction

This section presents the Energy Commission's policy issues and recommendations in these areas:

- Continue to harvest energy efficiency opportunities
- Diversify fuel types and sources as a hedge for California's future
- Leverage opportunities for customer choice
- Strengthen California's energy infrastructure

Continue to Harvest Energy Efficiency Opportunities

Using energy more efficiently is the state's primary focus. No matter which energy source we choose, increasing efficiency reduces energy costs, improves air quality, conserves natural resources, allows longer lead time for technological development, and lessens the uncertainty of planning for the future.

Technological improvements in transmission lines, buildings and renewable technologies will play a critical role, mitigating California's energy supply and price volatility. Continued research and development investments through the Public Interest Energy Research (PIER) program is critical to the success of this strategy.

Improve Vehicle Efficiency

In 1975, Congress established corporate average fuel economy (CAFE) standards for new passenger cars and light trucks. Currently, CAFE standards are 27.5 miles per gallon for cars and 20.7 miles per gallon for light-trucks including SUVs and minivans.

These national standards have not changed since 1985. Since that time automobile improvements have focused on performance, comfort and safety, not fuel economy. Further, sales for light trucks increased to nearly 50 percent of all new vehicles sold in California by the year 2000, eroding fuel efficiency gains from previous years.

In its recent report, *Reducing California's Petroleum Dependence*, the Energy Commission and California Air Resources Board examined a range of options for reducing petroleum consumption in California. The report shows that it is technically and economically feasible to reduce petroleum consumption below current levels, simply by improving vehicle fuel efficiency. For most of the efficiency options evaluated, fuel savings for consumers exceeded the increased cost of a more fuel-efficient vehicle.

Experts agree that the efficiency of new cars and light trucks can be improved significantly by existing and emerging automotive technologies such as improved

engines and transmissions, more aerodynamic styling, higher voltage electrical systems, and increased use of hybrid-electric and diesel propulsion systems. A national fuel economy standard of 40 miles per gallon for passenger cars and light trucks could save upwards of 10 billion gallons per year.

In addition to improving national standards, significant reductions in fuel use can be quickly realized through state government actions, such as establishing a tire efficiency program or requiring government fleets to use the most efficient vehicles. Improved maintenance of private vehicles can also help save fuel. Together, these actions can reduce fuel demand by 3 to 5 percent, saving about one-half billion gallons each year.

Recommendations

- The State should adopt a goal of reducing demand for on-road gasoline and diesel to 15 percent below 2003 levels by 2020.
- California should build a coalition with other states to influence Congress and the Department of Transportation to double the combined fuel economy of new passenger cars and light trucks by 2020. If the federal government fails to revise CAFE standards, California must reassess its petroleum reduction strategy.
- California should develop a public information program to inform consumers of the fuel savings benefits of efficient tires, proper tire inflation, and vehicle maintenance.

Improve Natural Gas and Electricity Efficiency

Maximize Cost-Effective Energy Efficiency

California can save significant amounts of electricity and natural gas by using existing technology, adding new technologies, and encouraging individual conservation efforts. The greatest economic potential for saving electricity lies in the commercial sector, followed by the residential sector.

Stimulating investment in energy efficiency by California businesses and residents has positive effects on jobs and the economy. Every dollar invested in cost-effective energy efficiency measures not only improves the economy, but reduces energy bills and frees up more disposable income.

California's building and appliance standards are the most cost effective means of achieving energy efficiency in the state. Since 1978, the cumulative savings have totaled more than 6,000 megawatts, and Californians have saved more than \$20 billion on their utility bills because of the existing standards. These standards will save an additional \$57 billion in electricity costs alone by 2011.

Voluntary energy efficiency programs and individual conservation efforts are the other major sources of energy savings. These programs and efforts are fueled by education, technical assistance, monetary incentives, and tax credits. During the state's 2001 energy crisis, consumers reduced their electricity consumption dramatically in response to public education campaigns like *Flex Your Power*. That summer, between 70 to 75 percent of the peak load reductions came from consumer conservation efforts while 25 to 30 percent came from energy efficiency investments.

The Energy Commission and the CPUC are collaborating on a plan to improve the operation of energy efficiency programs, carefully increasing program funding from \$285 million to \$572 million by 2008. By spending about \$5 billion over 10 years, the state would save consumers over \$15 billion.

Conventional, off-the-shelf technology can produce energy savings in existing buildings. In fact, the bulk of the energy efficiency funds collected under the Public Goods Charge have been spent on existing buildings. The Energy Commission is developing strategies to achieve additional savings in existing buildings. A mix of voluntary and regulatory approaches that supplement current incentive programs seems to be the most effective plan.

While electricity efficiency measures have a long and dependable history, efficiency programs to save natural gas are less developed. Doubling the funding for natural gas efficiency programs (from \$102 million to \$233 million) would reduce demand and save \$308 million a year by the tenth year.

California needs to continue research and development. Investments within the PIER program to reduce peak demand are fostering the development of new technologies, including roofing products, residential and commercial air conditioning equipment, industrial process technologies, storage technologies, and clean distributed generation. Other PIER research efforts are helping to develop new products, and more energy efficient building design, construction, and operational practices.

Achieving the most economical energy savings requires efficient program design, effective feedback, widespread customer participation, and reliable program funding. California's energy agencies will undertake a rigorous, ongoing monitoring and evaluation program to ensure that the savings and benefits from conservation and efficiency programs are being delivered. Programs not meeting their potential will be modified or eliminated.

Recommendations

The state should:

- Expand public funding of energy efficiency programs to harvest 1,200 megawatts and 103 million therms of energy efficiency savings.

- Standardize and increase the evaluation and monitoring of energy efficiency programs to ensure that savings and benefits are being delivered.
- Implement appropriate mandates, incentives, and funding to maximize the energy efficiency potential of existing buildings.

Evaluate Dynamic Pricing and Demand Response Programs

In California, the highest peaks in electricity demand are caused almost exclusively by air conditioning during unusually hot weather occurring a few times each summer (50-100 hours per year). These "super-peak" loads have traditionally been met by peaking power plants, by interrupting loads at industrial and commercial businesses, or by turning off residential air conditioners. These actions, however, have negative consequences: peaking power plants are expensive and polluting, while unplanned load interruptions cause economic loss, discomfort, and risks to public safety.

One of the ways to reduce peak demand is to send accurate price signals to consumers so they use less electricity during critical hours. Several pricing structures, collectively called dynamic pricing, are used for large customers. Dynamic pricing includes time-of-use rates and Critical Peak Pricing (CPP). Dynamic pricing reflects the cost of generating electricity. Consumers who shift their electricity use from peak times, when generation can be expensive, can benefit from lower rates.

New communication and control technologies provide information every 15 minutes on how much electricity a customer is using, allowing them to better control their loads and utility bills. In 2001 and 2002, real-time meters were installed for most large customers. These meters, combined with new communication and control systems, work together to reduce energy use when the price of electricity goes up. Several programs offered customers incentives to use them to reduce their energy demand. These programs successfully reduced peak load and increased reliability at times of greatest stress on the system.

Real-time meters need real-time pricing to be effective. In September 2003, the Energy Commission and the CPUC completed a study on dynamic pricing, which recommends a process to provide all electricity customers with a choice of flat, inverted tier, time-of-use, or dynamic pricing rates by 2009. Putting the new price structures into effect requires additional real-time meters, like those given in 2001 to large customers. The CPUC adopted several dynamic pricing tariffs for larger customers to use with their real-time meters. Investor-owned utilities (IOU) are currently looking at the results of those programs and are now testing a pilot project for residential and small commercial customers. Results of these activities will be available in 2004. The *Plan* targets reducing peak demand by up to 2,000 megawatts with these voluntary programs by 2007.

The next step is to determine if the real-time meters will pay for themselves with savings from reducing the state's peak energy use with the correct pricing structures.

Recommendation

- The state should rapidly deploy advanced metering systems if analyses show the results are favorable to the customer and will effectively decrease peak electricity use.

Diversify Fuel Types and Sources as a Hedge for California's Future

Reduce Petroleum Dependence

California's demand for gasoline and diesel fuel is projected to increase by almost 35 percent over the next 20 years. As a net importer of gasoline, California must address its growing dependence on petroleum now to avoid escalating economic and environmental burdens.

Higher gasoline and diesel prices, coupled with price volatility, reduce the real income of consumers. Petroleum price increases also drive up the average cost of producing goods and services throughout the state and national economies. Past petroleum price hikes in 1973-74, 1979-80, and 1990 all led to U.S. recessions.

Burning 17.5 billion gallons of gasoline and diesel annually poses a tremendous challenge to meeting present federal and state air standards. Exhaust from on-road vehicles represents about 50 percent of statewide nitrogen oxide (NO_x) emissions and about 36 percent of statewide hydrocarbon emissions, which combine in the atmosphere to form smog. In addition, emissions from refineries, and distribution and fueling stations create growing amounts of air pollution, while the state's water and coastal resources can be contaminated by oil spills and leaking storage tanks.

The magnitude of our petroleum fuel use also leads to increases in greenhouse gas emissions. In 1999, California sources emitted 428 million tons of greenhouse gases in carbon dioxide equivalent units. Of this, mobile source emission of carbon dioxide, methane, and NO_x were responsible for nearly 60 percent of the total statewide greenhouse gas emissions.

Options to Reduce Petroleum Dependence

California has two primary options to reduce its dependence on petroleum as a transportation fuel: 1) reducing the demand for transportation fuels in California, and 2) increasing the proportion of non-petroleum fuels and vehicles in the state.

Improving vehicle fuel economy alone, however, will not be enough to maintain petroleum reduction goals over the long-term. By 2020, the demand for gasoline and diesel fuel is projected to increase once more as the number of vehicle miles of traveled overwhelms efficiency benefits. For that reason, we must also increase our use of non-petroleum fuels, including:

- Natural gas
- Ethanol blends
- Liquefied petroleum gas (LPG)
- Non-petroleum derived diesel fuel such as Fischer-Tropsch and biodiesel
- Electric vehicles
- Hydrogen fuel cell vehicles

While these fuels can provide significant benefits to the state, a number of uncertainties are associated with their use. These include the availability of new vehicle technologies, the cost and availability of new fueling infrastructures, and acceptance of these fuels by consumers. Given the recent supply uncertainties and price volatility experienced in the natural gas market, California should proceed cautiously in creating a large natural gas demand for transportation.

Fleet applications have proven to be an effective market entry point for new transportation systems, particularly those that require a separate fueling infrastructure. Options such as compressed natural gas, liquefied natural gas, and LPG have been successfully used in bus and truck fleets and other high-use applications. Hybrid-electric vehicles, which use the existing fueling methods are emerging rapidly in the market, even with the relatively limited number of models offered by manufacturers. On the other hand, hydrogen fuel cells will require significant development and performance breakthroughs before they can become commercially viable.

Providing ethanol fuel for the existing fleet of flexible fuel vehicles (FFVs) currently on the road in California will help to diversify the state's market for transportation fuels. All U.S. automobile manufacturers are currently building some FFV models. California's ethanol FFV fleet now includes an estimated 120,000 vehicles, yet because no fueling infrastructure exists to supply ethanol, these vehicles use gasoline. Since 40,000 new ethanol FFVs are sold each year, this fleet could grow to as much as 400,000 vehicles by 2010.

Recommendation

- The state should increase the use of non-petroleum fuels to 20 percent of on-road fuel consumption by 2020 and 30 percent by 2030.

Reduce Natural Gas Dependence

California has become more dependent on natural gas as the primary fuel for electricity generation. Gas-fired generation has increased from 25 percent of California's electricity resources 20 years ago, to 36 percent of today's electricity supplies. The electricity generated by natural gas can vary year to year, depending on the availability of hydropower. Hydropower resources, including out-of-state imports, can range from as much as 45 percent of California's supply during a wet year to as little 12 percent,

during drought conditions. The dramatic drop in hydropower must be made up by increased generation from natural gas-fired power plants.

Options to Reduce Natural Gas Dependence

California has three primary options for reducing natural gas consumption for electricity generation:

- Reduce the demand for electricity in California, especially during peak periods.
- Replace gas-fired generation with renewable resources such as wind, geothermal, biomass, and solar.
- Replace or repower older, inefficient gas-fired power plants with newer, more efficient ones that consume less fuel and produce lower levels of air emissions.

By using less electricity overall, we use less natural gas to generate it. Programs targeted at cutting peak electricity use, when the most inefficient power plants are called upon to generate, would have the greatest impact on reducing our natural gas dependence.⁹ Reductions during peak summer hours also have the greatest impact on ratepayer costs and price volatility, since electricity costs are most affected by underlying gas prices during these periods.¹⁰

Using other fuels will also reduce the demand for natural gas. For a host of legal, environmental, and cost reasons, nuclear, large hydroelectric, residual fuel oil, and coal facilities are unlikely candidates for offsetting natural gas-fired generation for California. On the other hand, the development of cost-effective renewable resources such as wind, geothermal, biomass, and solar have tremendous potential in California to meet part of our future demand.

California's RPS is the centerpiece of the state's strategy to reduce our dependence on natural gas and to increase the diversity of our electricity system. The RPS requires all retail suppliers of electricity in the state to supply at least 20 percent of their sales from renewable energy resources by 2017. Last year, partly in response to concerns about growing natural gas dependence, the Legislature passed the RPS mandate. Because electricity generated from renewable resources will be sold under long-term contracts, they are immune to fluctuating natural gas prices, and helps to stabilize the market, providing real economic benefit.

With the goal of increasing renewable energy, the Energy Commission's PIER program is working to reduce the environmental impacts and costs of renewable resources. The goal is to encourage the use of renewable resources near load centers and ensure that these technologies are compatible with and can be integrated into the power grid.

Despite its support of renewable energy, however, California is increasingly dependent on natural gas generation. Even if we continue funding energy efficiency and demand-

side management programs (DSM) at present levels — and even if the state achieves its 20 percent goal set in the RPS — natural gas-fired generation in California is expected to increase from 36 percent in 2004 to 45 percent in 2013. In low water years, reductions in available hydroelectricity will push this percentage even higher. If California accelerates its use of renewable generation and meets the RPS goal of 20 percent by the year 2010 instead of 2017, we can double the natural gas savings that come from displacing natural gas-fired generation.¹¹

One of the best ways to reduce the state's consumption of natural gas used for electricity generation is to retire older, inefficient natural gas-fired power plants and to replace them with new, more efficient ones. Unfortunately, many of these older and inefficient plants are presently used to maintain system reliability.

In addition, the existing fleet of old, less efficient and dirty natural gas-fired power plants are used more extensively when the West experiences drought conditions. When that happened in 2001, heavy use of inefficient, dirty plants drove up natural gas demand and contributed to air pollution problems.¹²

Before California can retire or replace its old, inefficient natural gas-fired power plants, however, it must examine the contractual arrangements that dictate their use. Many have Reliability Must-Run (RMR) contracts with the California ISO or long-term contracts with California's Department of Water Resources. To replace the aging power plants now used for reliability purposes, their cleaner, more efficient replacements must receive similar financial incentives that recognize their benefits to local reliability and California's overall grid system.

California must consider an appropriate retirement strategy for old and inefficient gas-fired power plants.

Recommendation

- The state should enact legislation to move the target date for reaching the RPS goal of 20 percent to 2010.

Leverage Opportunities for Customer Choice

Promote Retail Customer Choice

Energy costs are an important part of doing business in California, accounting for a significant proportion of a company's operating budget. Even reducing energy bills by a small percentage can have a major impact on profits.

When California restructured its electricity market, it allowed companies and consumers to choose their electricity supplier (direct access) to secure the lowest prices. Questions facing energy policy makers today are whether that ability to choose is still beneficial to

large customers and if participation in such an electricity market should be voluntary or mandatory.

While direct access was voluntary for electricity customers, the natural gas market is different. Large natural gas customers are assigned to the “non-core” customer group, while smaller customers are designated as “core” customers. Local gas utilities are required to serve core customers, while non-core customers can shop around to purchase the cheapest natural gas supplies.

This model has been successful because it identifies a stable, unchanging group of customers. Since natural gas utilities are protected from customers who might return to their systems without adequate notice, they are able to effectively secure natural gas supplies, plan storage, and adequately cover their costs.

Under electricity restructuring, all customers were able to choose their supplier. As a result, many large users were in a state of flux, either seeking alternative suppliers or returning to their default local utility, without notice, if prices became too high or their electricity provider suddenly went out of business. As a result, electric utilities first found themselves with excess generation when customers left for alternative suppliers. Then they found themselves under-supplied when those same customers unexpectedly returned.

By creating a core/non-core structure in the electricity market, with very explicit contractual conditions for customers to return to their original supplier, utilities can plan with more certainty. At the same time, such a structure may provide merchant generators, who already have permits to build new power plants, with a customer base that is willing to sign long-term contracts.

System reliability is important. Non-core customers must meet specific reserve requirements, either by self-generating or by buying electricity through another energy provider. All customers would be equally responsible for securing electricity supplies to maintain the system’s reliability.

Recommendation

- The state should explore a core/non-core market structure for electricity, with the goal of making recommendations for market change by 2004.

Encourage Distributed Generation

Consumers should be able to choose electricity supplied either by a traditional utility or by a non-utility generating facility located at or near the point of consumption (commonly referred to as distributed generation), or by some combination of the two. More than 2,000 megawatts of distributed generation is now in place in California.

The *Plan* encourages distributed generation as a key component of the state's electricity system. The Energy Commission's Renewables Buydown program has provided more than \$25 million to promote distributed generation using solar and wind technology. The CPUC's Self-Generation Incentive Program has allocated approximately \$100 million to other projects not covered by the Energy Commission's program. The Energy Commission's PIER program also has invested over \$80 million for distributed generation research in the areas of emission reductions, reliability, and interconnection.

Most utility customers share the burden of electricity costs that occurred when the state had to purchase high-cost power during the electricity crisis. Until recently, a barrier to installing distributed generation has been the Cost Responsibility Surcharge, an "exit fee" charged to customers who leave the grid. The CPUC recently exempted 3,000 megawatts of distributed generation over the next 10 years from surcharge. The Energy Commission will determine which customers qualify for the exemption.

Strengthen California's Energy Infrastructure

Transportation Energy Infrastructure Issues

As refiners import more crude oil, Californians should be concerned about the adequacy of the state's marine infrastructure, gasoline and diesel supplies. The Energy Commission has studied the state's ability to import petroleum products and concluded that the system of wharves, storage tanks, and pipelines is at or near capacity.

Marine vessels need storage tanks large enough to allow them to off-load their cargoes in a timely manner. The Energy Commission's study found that the state's petroleum product storage infrastructure is inadequate. The problems are most serious in Southern California, where the bulk of increased quantities of imported crude oil and finished petroleum products will be received.

Unless this infrastructure is expanded, refiners will not be able to meet demand with additional imports which may increase price volatility. It is essential that additional marine and storage facilities are constructed and operating as the demand for transportation fuel increases.

Acquiring construction permits from multiple local, state, and federal authorities however can delay infrastructure improvements. This existing inefficient and overlapping permitting system has contributed to a shortage of storage capacity, leading to higher lease and rental rates for storage tanks. As a result, suppliers minimize their inventories, making for tighter markets and higher prices.

The state has successfully dealt with similar permitting problems. To help license power plants, the Legislature passed the Warren-Alquist Act in 1974, establishing the Energy Commission as a one-stop permitting agency. The Commission's 12-month public process consolidates all state and local agencies into a single permitting process that meets the requirements of the California Environmental Quality Act.

Recommendation

- The state should establish a one-stop licensing process for petroleum infrastructure and refineries which would expedite permits to increase supplies of transportation energy products available to California.

Electricity Infrastructure Issues

California's electricity system should be based on a strategy that incorporates energy efficiency, resource diversity, and consumer choice. These components encourage features like demand-side options, renewable resources, and distributed generation. These strategies, along with conventional generation, can play an important role in securing the state's reliable electricity supplies.

Electricity resources, however, can sometimes fall short of forecasts. Extreme weather conditions can affect both demand and supply. High temperatures will drive up air conditioning demand. Droughts will curtail the amount of electricity supplies available from hydroelectric facilities.

In the same way, the mix of resources may not produce as well as we anticipate. Some demand-side options depend on consumer behavior that may meet, exceed, or even fall short of expectations. Similarly, while the benefit of accelerating the development of renewable energy is clear, funding may not be available to bring such benefits to fruition.

When planning for system reliability, the Energy Commission must also make predictions about the state's economic health. Unexpected rapid growth may cause the state to run short of electricity, dampening the benefits of a bustling economy. On the other hand, it is also possible that the state could experience a recession within the same time period, resulting in lower demand.

Different contingencies call for different resource solutions. When planning for hot weather conditions, short-term generation from natural gas-fired combustion turbines is a reasonable resource if energy efficiency measures are unable to balance supply and demand. These sorts of resource uncertainties, fortunately, are short-lived.

California has added over 9,500 megawatts of new, efficient natural gas-fired generation in the past four years. Older natural gas-fired generators, however, continue to play a unique role in the state's electricity system. As a result of existing contracts or their importance to system reliability, older, less efficient plants displace the newer, more efficient, cleaner gas-fired generators.

To address these concerns, the Energy Commission intends to study the attributes of each of these older units. The study will examine what system constraints and contractual requirements prevent the new, more efficient plants from generating.

For the resource preferences outlined by the Energy Commission to be successful, they must be incorporated into the CPUC's procurement process. Currently the CPUC is examining long-term resource plans of the three IOUs and attempting to expand the procurement options available to them.

The CPUC must also specify requirements for load-serving entities and generators in order to provide sufficient resources to make the system reliable.

Recommendations

The state should:

- Ensure load-serving entities procure, in the sequence prescribed, the preferred energy resources recommended in this report.
- Incorporate, as soon as possible, RPS resources and other preferred resource additions into long-term procurement.

Transmission Infrastructure Issues

California's transmission system links power generators to their customers in a complex electrical network. It balances electricity supply and demand on a moment-by-moment basis to reliably deliver the lowest-cost generation. The system must be upgraded to respond to changes in generation and load patterns, including the addition of renewable generation being aggressively developed through the state's RPS program.

The existing transmission system regularly experiences congestion. Transmission constraints in some areas affect both the economic and reliable operation of the system. Transmission upgrades, generation additions and demand-side management actions may provide solutions to these problems. However, existing transmission planning and permitting processes have not effectively identified and approved such actions.

Transmission Planning Issues

Modernizing and upgrading the bulk transmission grid should be the centerpiece of California's electricity planning process. But the state has no official role in transmission system planning. The California ISO and the IOUs are responsible for about 80 percent of the California grid. In most cases, publicly owned utilities and federal agencies plan and build transmission projects to meet their own reliability and economic needs.

This fragmented approach to transmission planning means that no statewide interests are considered in this process — interests such as future right-of-way needs, the environmental performance of the system, and development of renewable resources.

At present, the planning process ignores long-term project benefits, plans for average conditions and fails to recognize the cost of low-frequency but high-severity events,

such as droughts, regional blackouts, and temperature extremes. Because of these fluctuating conditions, those transmission lines that have been built have generally paid for themselves in just a few years. The state needs to be innovative in the analytical methods that are used for evaluating the costs and benefits of transmission projects.

The Energy Commission is collaborating with the California ISO and the utilities to address the state's critical transmission infrastructure needs. The process, which will build on the ISO's annual transmission plan, will evaluate transmission, generation and demand-side alternatives and compare the costs, benefits, and alternatives to individual projects, using more innovative methods.

Transmission Permitting Issues

Permitting transmission lines in California is a morass of fragmented and overlapping jurisdictions with inconsistent environmental analyses coupled with a lack of consideration for regional and statewide benefits. This results in delay of approvals and denial of needed projects.

Merchant transmission line projects are subject to multiple jurisdictional reviews, whereas publicly-owned utilities are responsible for performing their own environmental reviews, regardless of the local jurisdictions they cross. Publicly owned utilities only consider benefits to their own ratepayers. IOU projects are examined by the CPUC, with environmental reviews typically done by outside consultants rather than professional staff. The CPUC is required to focus on the benefits to utility ratepayers rather than on benefits to the statewide system.

Because of this requirement, as an example, in the late 1980s the CPUC refused to allow Investor-Owned Utilities to build the California-Oregon Transmission Project.¹³ The project, subsequently built by municipal utilities, now provides critical capacity for importing electricity from the Pacific Northwest. The Path 15 upgrade and the Valley-Rainbow project have experienced similar challenges within the CPUC process.

Supplies of reliable and reasonably priced electricity — as well as increasing electricity from renewable resources — are dependent on a well-maintained and adequate transmission and distribution system. The *Plan* calls for the state to "...reinvigorate its planning, permitting, and funding processes to assure that necessary improvements and expansions to the distribution system and the bulk electricity grid are made on a timely basis."

To meet this goal, permitting for new bulk electric transmission lines should be consolidated with and modeled after the Energy Commission's current licensing process for generation. This step, as identified in the Energy Commission collaborative transmission planning process, would include public input and a comprehensive independent review in a specific time frame.

Recommendation

- The state should consolidate the permitting process for all new bulk transmission lines within the Energy Commission, using the Energy Commission's power plant siting process as the model.

Natural Gas Infrastructure Issues

California is located at the end of the West Coast's natural gas pipeline and relies on storage to meet peak day demand. That makes it doubly important that natural gas storage be efficient.

California presently has 243 BCF of storage capacity, split evenly between the northern and southern parts of the state.¹⁴ More than 5 BCF a day of natural gas can be withdrawn from storage on a peak demand day. Additional storage projects strategically located could provide added security against price and supply shocks.

LNG terminals are a potential source of natural gas to supplement declining supplies from North American basins. More than 8 BCF per day of LNG capacity is being proposed. Given that the Baja region of Northern Mexico is already part of North America's gas system, future improvements to the existing natural gas infrastructure could allow LNG to flow into Southern California and points east. We need to overcome regulatory barriers, however, that may inhibit the use and distribution of LNG in California. State agencies must coordinate the review and permitting process to site, build, and operate LNG import terminals, in accordance with all federal and state environmental, public health, and safety standards.

Recommendation

- The state should ensure that existing natural gas storage capacity is appropriately used to provide adequate supplies and to protect prices.

Section IV: Stewardship of California's Environment

The increasing demand for energy in California is placing unprecedented demands on the electricity, natural gas, and transportation fuel infrastructures and the state's environment. California must strike a balance between delivering increasing levels of energy and its commitment to environmental quality. The challenge to policy makers will be, not just to sustain the current status of the environment, but to improve environmental quality while meeting the wide-ranging demand for energy. This section addresses several topics where energy and the environment are inextricably linked and where clear policy direction is warranted.

Protect Fresh Water

Clean fresh water is a critical resource in California. The state's burgeoning population is expected to exceed 47 million in 2020, and combined with agriculture, business and industry will use more fresh water at rates that cannot be sustained. Imbalances in available fresh water supplies result in "average year" shortages projected in every region except parts of the San Francisco Bay area and the North Coast.

Power plants are among the state's many water users that affect fresh water supply and water quality.

Water Supply

In recent years, many new power plants have been sited in areas of the state with limited fresh water supplies. Although power plant cooling uses a relatively small amount of water when compared to the needs of other industries, it can cause significant impacts to local water supplies.

Degraded surface and groundwater can be used for power plant cooling. When sufficient quantities are available, reclaimed water is also a commercially viable cooling method. Two new combined-cycle facilities that recently came on line are cooled with recycled water. Alternative cooling options, such as dry cooling, are available and can reduce or eliminate the need for fresh water. Two power plants using dry or air cooling became operational in 1996 and 2001. A third project using dry cooling in San Diego County has already received a construction permit from the Energy Commission.

Water Quality

Wastewater discharges can have a negative effect on groundwater, surface water, and land. These impacts are being controlled through technologies such as zero liquid discharge systems to meet state water quality standards. Since 1999, three power plants using this technology have come online. Many other projects now under licensing review or construction are expected to apply this technology.

Water conservation is of paramount importance. Indeed, conserving fresh water and avoiding its wasteful use have long been part of the state's water policy. Power plants have the potential to use substantial amounts of water for evaporative cooling and can discharge contaminated wastewater. For those reasons the Energy Commission applies state water policy to minimize the use of fresh water, promote alternative cooling technologies, and minimize or avoid degradation of the quality of the state's water resources.

To implement this policy, the Energy Commission will only approve the use of fresh water for power plant cooling purposes by power plants when alternative water supply sources and cooling technologies are shown to be "environmentally undesirable" or "economically unsound."

Global Climate Change

Climate change represents a significant risk to California. The signs of a global warming trend are becoming more evident and much of the scientific debate is now focused on expected rates of future changes. Rising temperatures and sea levels, along with changes in hydrological systems, are threats to California's economy, public health, and environment. Although these changes are not entirely predictable, climate change could lead to flooding of coastal communities, drought on our farmlands, disease and fires in our forests, decline of fish populations, reduced capacity to generate hydropower, and loss of habitat. Preliminary research shows that energy expenditures in California alone could increase by as much as \$2 billion by 2020 as a result of warmer climate.

While California has been a leader in climate change through its inventory activities and the establishment of the Global Climate Change Registry, more can be done to prepare for an uncertain climate future and to improve the resiliency of the state's economy. Taking appropriate steps to address risks posed by climate change can help insure a more sustainable future and benefit the state's citizenry and natural and economic resources.

Recommendations

The state should partner with its neighbors to take on leadership positions to address global warming by undertaking actions including, but not limited to, the following:

- Require reporting of greenhouse gas emissions as a condition of state licensing of new electric generating facilities.
- Support the goals to reduce current petroleum consumption by motor vehicles by 15 percent by 2020.
- Use sustainable energy and environmental designs in all state buildings.

- Require all state agencies to incorporate climate change mitigation and adaptation strategies in planning and policy documents.

Cross-Border Issues

California's environment along its border with Mexico is affected as much by energy consumption in California as it is by energy consumption across the border. Mexico has experienced strong industrial growth in its border area, resulting in increasingly severe air pollution. States along the United States/Mexico border experience the impact of increased emissions from inefficient power plants and boilers, fueling facilities, highly polluting industrial facilities, and traffic congestion. Baja California presents both compelling energy challenges and tremendous business opportunities for California.

Recommendation

- The state should conduct a Mexico Energy Program to fulfill joint declarations developed by the Border Governors' Commission Energy Worktable. The program should address energy and air quality issues on the California-Mexico border and stimulate energy technology exports for California energy companies.

Hydroelectricity Facility Re-licensing

Hydroelectricity has historically played an important role in meeting California's electricity needs. Its low production costs and unique ability to meet critical peak demand have long benefited the state's ratepayers. Some hydroelectric projects unfortunately have serious environmental consequences such as significant, ongoing impacts to many California rivers and streams, native salmon and trout populations, and the water quality needed to support sustainable riverine ecosystems.

Restoration of imperiled salmon and trout fisheries is one of California's important environmental policy objectives. Since most of the state's hydroelectric facilities were licensed by the Federal Energy Regulatory Commission (FERC) more than 30 years ago, they were not subject to current environmental standards. By 2015, 44 FERC-licensed projects in California will seek renewals, giving the state the rare opportunity to address problems with existing fisheries and aquatic resources. In addition, decommissioning of high-impact hydroelectric facilities that supply little power is also a viable method of restoring important aquatic habitat, without significantly affecting statewide electricity supply and reliability goals.

California's Department of Fish and Game and the State Water Resources Control Board both have principal roles as the state's representatives in FERC's re-licensing of hydroelectric facilities. The Energy Commission is helping these agencies and FERC understand the effects that operational and structural changes to these facilities will have on regional and statewide electricity supply. By adjusting California's hydroelectric system to reflect current environmental standards, the state can achieve important restoration benefits.

Section V: Conclusion

In three short years, California has weathered an electricity crisis, unparalleled natural gas price spikes, and the highest gasoline prices in the nation.

As the fifth largest economy in the world, energy is a vital concern to California. Through crises, error, and innovation, California remains a world leader in energy policy and technology. What begins in California eventually moves throughout the world.

Since the 1970s, California has responded to each energy challenge by developing efficiency programs, promoting new forms of renewable energy, and fostering research and development. These efforts pushed the boundaries of regulation and private investment.

California's growing population demands reliable and reasonably priced energy. Yet today, California finds itself facing an aging energy infrastructure and ever-growing demand.

The state rightfully feels a sense of urgency. Finding the most cost-effective, reliable, efficient resources, while protecting our environment, calls for more than a "business-as-usual" approach. If California's energy future is to remain economically workable and environmentally sound, progressive energy policy must remain high on the state's agenda.

The recommendations described in this report represent an aggressive, wide ranging agenda for decision makers, businesses, and individuals. The Energy Commission believes that this report, along with its subsidiary reports, lays the proper foundation for future action.

¹ The Energy Commission under SB 1389 (Bowen), passed by the Legislature and signed into law in 2002, must develop an Integrated Energy Policy Report. As part of this mandate, we have the responsibility for developing energy policies for California that conserve resources, protect the environment, ensure energy reliability, enhance the State's economy, and protect public health and safety. Public Resource Code section 25301(a).

² The industry points to permit restrictions and the lower costs of building refinery capacity in other parts of the world as the major factors hampering new refinery capacity additions in the state.

³ Direct access to alternative electricity suppliers was a central piece of AB1890 (provide reference), which passed in 1996 and resulted in a restructured electricity market in California.

⁴ The CPUC suspended direct access in Decision 01-09-060 in response to AB 1x1 (Keeley).

⁵ At the peak of the energy crisis, the Federal Energy Regulatory Commission withdrew its authorization of the California Power Exchange—an hourly electricity spot market. As a consequence, California had no way to play contract terms off against spot market purchases in its negotiation with generators in early 2001. In this sellers' market, the State Department of Water Resources signed a number of high-priced, long-term contracts some of which contain inflexible operating requirements that match poorly with system requirements.

⁶ Economic activity is measured as Gross State Product.

⁷ The actual level of natural gas demand for electric generation can vary significantly, depending upon the amount of available hydroelectric power in any given year.

⁸ In the summer of 2000 an El Paso Natural Gas pipeline explosion on the El Paso natural gas pipeline system significantly reduced flows into California. In addition, due to a combination of withholding and competition for scarce pipeline capacity at the height of the energy crisis, infrastructure constraints contributed to high natural gas prices in the state.

⁹ Staff Draft Electricity and Natural Gas Report, California Energy Commission, August 8, 2003, p.132. During peak hours, like a hot summer afternoon, the electricity system's incremental heat rate is 12,000 Btu per kWh or greater. This compares with heat rates on the order of 7,000 Btu per Kwh for new gas-fired power plants. Demand reductions during off-peak periods, such as early summer morning or during spring runoff season, have much less of an impact – on the order of 40-50 percent of the natural gas savings that can be achieved on-peak.

¹⁰ During peak demand periods, the largest share of electricity is traded at spot prices and other short-term prices heavily dependent on natural gas prices.

¹¹ Staff Draft Public Interest Energy Strategies Report, California Energy Commission, August 8, 2003, p. 94.

¹² Many of these plants were operating at 40 to 60 percent capacity factors, compared with capacity factors in 2002, a more normal hydro year, in the range of 20 to 30 percent, with heat rates that range from 10,000 to 13,000 btu/kWh and NOx permit emissions levels of 7 ppm to as high as 40 ppm and above. This compares with new natural gas combined cycle plants that have heat rates of 6,000 to 7,000 btu/kWh and NOx permit emissions levels ranging from 2 to 2.5 ppm. Staff Paper on Aging Natural Gas Power Plants in California, California Energy Commission, July 2003

¹³ The original CPCN for COTP included an upgrading Path 15. Had the project been approved by the CPUC, when COTP was built by the municipal utilities, it would have eliminated most of the congestion on that path that caused severe problems during the energy crisis and that continue today.

¹⁴ Wild Goose is presently expanding its facility, increasing doubling its capacity to 29 BCF and expanding its withdrawal capacity with 700 MMCF/D.